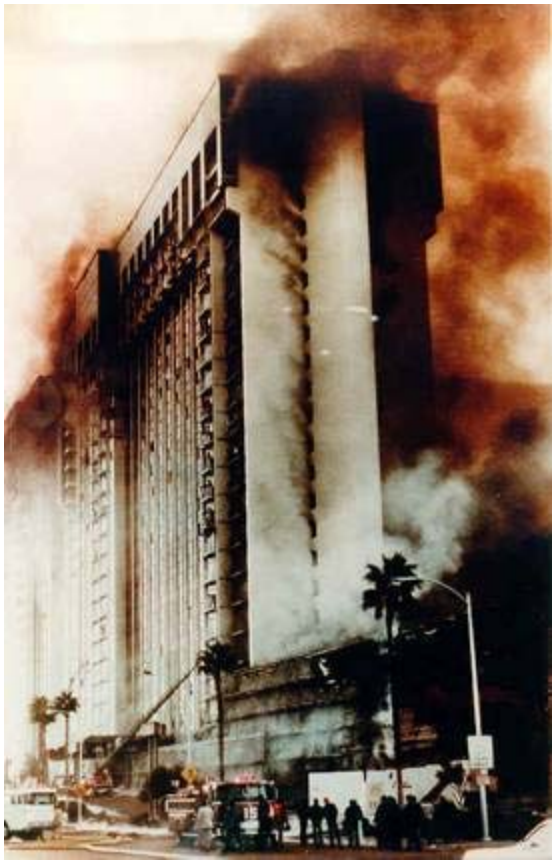
MGM Grand Hotel Fire Disaster, A Turning Point for Fire Protection Codes

Leadership ViTS Meeting
5 July 2005
Bryan O'Connor
Office of Safety and Mission Assurance

The Mishap

- Sparks from a short circuit in a hotel deli started a major fire at the MGM Grand Hotel in Las Vegas, Nevada, at 7:10 AM on November 21, 1980.
- The fire engulfed the world's largest gambling hall in smoke and flames.
- The fire was concentrated near the casino on the upper entertainment level.
- Thick black smoke filled the air ducts and escape stairwells in the 21-storey guest tower causing panic and death.
- Eighty five people died and more than 600 were injured, primarily due to smoke inhalation.



MGM Grand Hotel and its Fire Protection

- The MGM Grand is an enormous facility featuring a casino, two 100-seat theaters, 40 shops, 5 restaurants, 2076 guest rooms, a jai alai fronton and a sports arena.
- The most important MGM fire protection systems (on paper) during the fire were:
  - the building egress system to provide safe passage routes out,
  - fire detection, suppression and alarm systems,
  - a system of fire zones to isolate sections of the hotel and prevent spreading of fire and smoke,
  - a heating, ventilation, and air conditioning (HVAC) system designed to stop the inflow of air during a fire.

Disaster Causes

- Proximate cause: electrical fire in unoccupied deli
- Second level cause: no automatic sprinkler system in the deli
- Third level cause factors:
  - HVAC system design deficiencies (improper air flow during fire)
  - Alarm system design deficiencies (system vulnerability to fire)
  - Unusually high amount of flammable material in building
- Two root causes:
  - Hotel management neglect or indifference: Emergency systems were allowed to deteriorate, and new technology was ignored
  - Inadequate fire inspection: Despite the numerous flaws of its fire protection systems, the MGM passed fire inspection just six months prior to this disastrous fire.

Fire codes were revised nationwide as a result of the MGM Grand Hotel fire.

What Does This Have to Do With NASA?

- Do we validate and verify hazard controls during design?
- Do we revalidate and reverify controls when the design or operation changes?
- Do we periodically revisit our hazard controls?
- Do we practice emergency procedures?
- Do we debrief emergency drills?
- Do we demand professionalism from our internal inspectors and auditors?
- Do we treat independent inspectors and auditors as boarding parties, or as opportunities to save lives?

Constant Questioning is the Price of Safety

BACKUP

Why Were the Safety Systems Defeated?

- **Three factors caused the fire protection systems at the MGM Grand Hotel to perform poorly during the November 21 fire**
  1. **The original construction did not fulfill the intent of the designers. Materials with inadequate flame spread and smoke ratings were used to build ceilings and attic areas.**
  2. **The contents of the casino level were unusually flammable. Decorations, furnishings and finishes on the casino level contained high amounts of synthetic flammable materials that produced large amounts of smoke.**
  3. **Physical and operational modifications made since the hotel opening reduced the effectiveness of the fire protection systems. Smoke paths across fire zone enclosures were left open or were covered with flammable materials. Several areas designed for 24-hour use did not have sprinklers under the assumption that fire could be quickly detected there. One such area was the deli where the fire started which was closed due to low use.**

Hazard Controls that Weren't

- The fire incapacitated the alarm system preventing people from the tower from getting a timely warning.
- The fire zone enclosures were inadequate, or burned allowing smoke to enter hotel air ducts, elevator shafts, and ***stairwells***.
- The HVAC system provided fresh air from the outside instead of depriving the fire of oxygen.
- The building egress system proved to be the deadliest factor… the only guest exit paths were from rooms down stairwells to the street. Once guests entered stairwells, self-locking doors trapped them in smoke-filled stairwells preventing them from returning to the hallways.
- Only the automatic sprinkler system worked as designed preventing fire from spreading into the guest tower or beyond the casino-level areas that were equipped with sprinklers.